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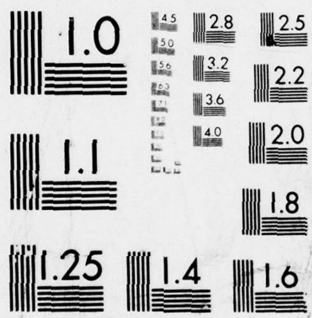

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THE DYNAMICS OF BIOPLASMA AND METABOLISM

by

W. Sedlak

FOREIGN TECHNOLOGY DIVISION

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THE DYNAMICS OF BIOPLASMA AND METABOLISM by Wlodzimierz Sedlak

A new look at the dynamics of the living organism from the bioplasma viewpoint has been consistently developed in Polish research since 1967, thus since the proposal and definition of the term bioplasma [24]. This was a consequence of the development of the fundamentals of bioelectronics and work on the semiconductor model of the biological system [25]. The concept of bioplasma was derived from bioelectronics, molecular biology and solid state plasma physics.

A Brief Summary of the Nature of a Physical Plasma

The state of matter defined by the term plasma (Langmuir 1928) has its own peculiar features differing from other states. An essential property is the complexity of charges of both signs and of neutral atoms ~~containe~~d in an electrical quasi-equilibrium. A description of plasma is made in two dimensions. On a microscale ~~Microscopically~~ it deals with the reciprocal reactions of electrical components. Plasma continually evens ~~levels~~ out its general level of ionization and returns to the basic state through processes of recombination, a cyclotron effect and photons obstructed by high-speed electrons. These three processes join in the emission of radiation in the visual spectrum.

The macroscopic description embraces the behavior of the plasm as a whole. Here it is treated as a conductive fluid, for which the laws of hydrodynamics and electrodynamics are important. Among the phenomena of this category should be mentioned magnetohydrodynamic waves with the existence of magnetic fields. On the micro scale and on the macro scale plasma is the generator of electromagnetic waves, in the visual spectrum in the first case and with a free oscillation in the second. For every discontinuity of the type of local electrical, magnetic, chemical, temperature, gravitational, acoustic, kinetic or density changes in the components, the plasma reacts by

an aberration in its electrical nature, expressed in a ~~suitable~~ corresponding radiational variation.

A characteristic feature of this state of matter is its instability, the constant bonding of energy and its losses in degradational processes. For its "life" plasma requires a continuous supply of energy for the purpose of guaranteeing an adequate number of negative and positive particles in equilibrium. Therefore plasma requires continuous "heating", or a supply of energy (stabilization process) for the purpose of covering its losses, mainly of the electromagnetic type, in degradational processes. The equilibrium between these two opposing processes determines the "life" of plasma. Its characteristics are best based ~~on the best developed~~ on gas plasma, but nonetheless the term plasma is used in solid state physics, as with semiconductors or electrolytes. It is sufficient for the condition of electrical duality of the particles in equilibrium to be fulfilled. Initially only p–n bonds were called microplasma in semiconducters [22], but at present the idea of solid body plasma is applied to the entire semiconducter mass.

Plasma is a state of matter with exceptional dynamics due to the collection of energy in it. The energy balance is in an unstable equilibrium, and the plasma state is produced continuously through a supply of energy and degrades as a result of energy losses, mainly of the radiational type. Plasma forms continually and decays constantly. Every change in its environment, electrical, magnetic, thermal, chemical, acoustic or gravitational, determines a change in its electrical harmonization. Therefore, it is not only a condenser, but at the same time a transformer, of all energy as a result of electrical activity. Plasma dynamics, so to say, is realized on two levels, the quantum level as a result of the mutual interaction of charged particles, and the macroscopic level or plasma dynamics as a whole. Thus electrodynamic laws are

united with hydrodynamic laws to form the energetic independence of the plasma state.

Plasma is piezo-electric, meaning that it is subject to plastic deformation in a variable electrical field, thus producing an acoustic wave. It is pyroelectrical because its polarization is changed by the activity of pressure forces of a hydrostatic or temperature type. It is diamagnetic, but can connect lines of a magnetic field and produce magneto-hydrodynamic oscillations. Finally, it is electrically neutral, but the individuality of the charged components behaves electrically. Just as do semiconductors in regard to impurities, it reacts to chemical additives by changing its electrical state. It possesses laser properties, and can cause forced radiation. From the point of view of dynamic reactions it is universal. Its "life" is spent at a high energy level, because it is the excited state of material, so that a minimal energy deviation in the environment is recorded by a change in its properties, and likewise in its radiation.

Electrical Properties of the Basic Biological Mass.

The first hint of a semiconductor in protein [34] was experimentally verified in a series of tests [23]. It was demonstrated for nuclear gasses [10], lipids, and particularly carotenoids [5] and porphyrins [14]. It was also established that minimal traces of humidity basically change the conductivity of protein. In addition electrical properties of the piezo-electric type were discovered in amino acids [40], protein, DNA and RNA [9] and in many sugars. Vegetable and animal tissues were tested. It was found that they are all piezo-electric. This is also a feature of many polymers [13]. The same should be stated about the ferroelectrical properties of biologically important organic compounds, as well as of tissues [1]. The pyroelectric features of collagen, nerve tissue, cartilage and connective tissue generally have been recently established [2].

The electronic material in the living organism is composed of molecular semiconductors, for which the band theory of semiconduction is not completely applicable. According to Szent-Gyorgyi [36] electron mobility is achieved in three ways. It is possible to distinguish: a) dislocation of electrons of aromatic and heterocyclic compounds, including pi electrons [15], b) transfer electrons between molecular donors and acceptors [8], and c) electrons in compounds with conjugated saturated and unsaturated bonds.

In addition hydrogen bridges, characteristic of peptide and nucleic acid bonds, are the place of electron transport. Therefore an organic semiconductor has special conditions for charge mobility. Instead of the positive "holes" of inorganic semiconductors, we find aqueous protons of crystalline structures ~~of water~~, an inseparable component of protein semiconductors in the biological organism. Mobile protons are found more and more often in mitochondria [19], during electronic processes of photosynthesis in chloroplasts and in the work of the enzymatic system [41].

Hydrogen bridges are also treated as proton states, using the name dislocated ~~delocalized~~ protons. We also meet proton dislocation ~~delocalization~~ in aqueous compounds and in ice. Proton mobility in the latter case is somewhat less ~~smaller~~ than electron mobility in metals [43].

A semiconductor achieves movement of charges of both signs, knocking out electrons under the effect of photons (the photoelectric phenomenon), and emitting the electroluminescent photons under the activity of an electrical field, changes its electrical nature with minimal chemical contamination in concentrations on the order of $1:10^9$ atoms, and provides all kinds of information by the changes in its electrical features. All of these "virtues" of a protein semiconductor determine the electrical properties of a biological system.

The functional "heart" of electronic equipment in technology is the p-n bonds forming boundaries between two characteristics of donor and acceptor type semiconductors. The role of p-n bond is ascribed to hydrogen bridges, as well as to the donor-acceptor systems, ~~as~~ like suitable pairs of pyrimidine and purine bases [21]. Bonds of this type can form an amphoteric protein molecule with a NH_3 group and a COOH acceptor.

A basic feature of electronic equipment is ~~the~~ varied functioning based on minimum structural complexities, leading precisely to the p-n bond with the use of the basic semiconductor properties. In addition the variety of tasks is achieved here with the least demand for matter, whence miniaturization of equipment. Precision and an unusually low energy supply with exceptional performance complete the characteristics of electronic equipment.

The analogies between technical electronic equipment and the biological system constructed of organic semiconductors provided the basis for proposing an electronic model of a living organism [25]. Work on the model has proved to be outstanding, because it has managed to solve many problems with great probability, or at least to perceive them, and ~~primarily to~~ above all has developed bioelectronics itself.

An Outline of Bioelectronics

Szent-Gyorgyi introduced the term bioelectronics [26], applying the fundamentals of quantum mechanics to organic compounds with semiconductor properties. He solved some problems or proposed their interpretation, and primarily created the ~~supports~~ bases for submolecular biology [35]. Independently of him, A. and B. Pullman, developing quantum biochemistry, provided new data in the semiconductivity of biologically important organic compounds which, along with experimental findings about semiconductivity, provide the basis for modern bioelectronics.

A turning point was the proposal for a semiconductor model of the biological system, with considerably wide-spread results from the basis of experimental model fundamentals. A significant step, as well as something new, was the comparison of the semiconductor biological system with technical electronic equipment and ~~their~~ its theoretical elaborations. Analogous results and new research prospects were then obvious, the electromagnetic theory of life [26], the electrostatics of a living system [24, 25], biological laser processes [29], and bioplasma and its parallel~~s~~ism with metabolism [27, 30].

Initially the term microplasma, applied to the p-n bond, was used in brief for the entire inorganic semiconductor mass. This was justified by the band theory of semiconductivity. Further research followed this line [20]. Solid state plasma is a variation of plasma at low temperature. Electrolytes are considered according to the same principle in an equilibrium of concentrations dissociative for plasma.

However, analogies between the biological and electronic systems based on a semiconductor substrate do not present signs of equality between technological equipment and an animate object. The protein semiconductor is not independent, and requires feeding, just as electronic devices do. In the living organism this is achieved by uniting chemical reactions with electronic processes.

The preeminent dynamics of the biological system, the performance of various activities with low energy expenditure, independently of often unfavorable environmental conditions, and maintenance of live activity on the planet Earth despite them for approximately 4 billion years, all of these make biological dynamics especially interesting from the point of view of energetic conditioning.

Without some additional factor it is difficult to explain a series of reversible chemical reactions which do not end their bidirectional movement

after a few fluctuations and do not end up at the dead point of a balance between reagent concentrations. Mechanical modeling of evolutionary processes ~~have~~ has demonstrated that, without an external power supply, the development of life would have come to a quick end [12]. Experimental data on the weakening of the biorhythms of the human organism, isolated from natural electromagnetic fields in the environment, tend to the same conclusion [42].

It is impossible to explain why weak disturbances in the geomagnetic field provoke signs of schizophrenia [3], since this is conditioned biochemically according to the latest diagnoses [7]. Why should the weak intensity of low frequency electromagnetic waves, so-called atmospherics, interfere with the catabolism of mucopolysaccharides, cations and water? Finally, why should microwaves, although they do not cause any thermal changes or ionization, disrupt the coordinating activity of the vegetative nervous system regulated biochemically? Nor do we know on what basis changes in an electromagnetic field interfere with the circadian biochemical rhythm of an organism. In general the passage from biochemistry to electromagnetics and back appears enigmatic, although indispensable. Are we not faced with a search for a common factor? Apparently it is bioplasma.

Bioplasma, a New State of Matter

Up to now there has been an increase in facts ascertained without any ~~reciprocal~~ mutual connection. A collection of documentation on the semiconductivity of biologically important organic compounds has increased independently of the more and more numerous proofs of weak luminescence in organisms. Photobiology is developing along with these, and, independently of it, the quantum biochemistry worked out by the Pullman's and molecular biology. Specialization never leads to spontaneous integration, because this requires some kind of at least hypothetical idea and of work undertaken in this direction. Despite the creative idea of bioelectronics of Szent-Gyorgyi in his outline of submolecular

biology, the science of life has remained significantly retarded in comparison with the development of solid state physics. However, all of the data resulting from the development of bioelectronics ha~~s~~ve existed for a shift to bioplasma as a uniform base for all living phenomena.

In Polish research bioplasma is a result of the development of life sciences. This is most generally defined as the energetics of the biological system through moderated electron states, both of molecular structures and of chemical processes. In some way plasma B (the term is from A. Cielecki) is composed of two fractions.

1. The structural fraction, mostly corresponding to solid state plasma, is conditioned by the mobile electrons of molecular envelopes. Dislocated ~~Delocalized~~ electrons of aromatic compounds, including pi electrons, conjugated structures of saturated and unsaturated bonds of carbon atoms, and electronic passage in donor-acceptor systems are characterized by mobility. By its very structure an organic semiconducter forms a possibility for electron actuation. Thus the structures of organic compounds form the semiconducting environment of plasma.

In addition there has been evolution in the formation of supramolecular structures, chiefly of two layers, defined in electronic technology as sandwich structures. They form p-n bonds of different electron density. Mito~~Hypo~~chondria, cell membranes, Golgi's complex, the endoplasmatic reticulum, chloroplasts and ribosomes exhibit sandwich construction. In addition the bonds are interpreted in semiconductor physics as microplasma.

Thus both the conditions of electronic architectonics of organic molecules and their sandwich structures, along with the hydrogen bridges characteristic of proteins and nucleic acids, form a basis for structural bioplasma, if it can be expressed this way [30]. The production of these structures is achieved metabolically. In principle the structure is subject

to reconstruction or an exchange of atomic elements by new ones. Thus ~~is~~ it differs from a nonbiological semiconductor, as well as from an organic one in a laboratory situation.

Recently work has been undertaken on the quantitative relations of charges in subcellular structures. Using a diffraction method, the density of electrons in ~~bubble~~ double protein-lipid layers was calculated as follows: 0.37-0.51 electron/A^3 for protein, 0.334 electron/A^3 for water, and 0.50 electron/A^3 for lipids (6), which amounts to $3.7-5.1\cdot 10^{20}$ electrons in protein, $5\cdot 10^{20}$ in lipids, and $3.34\cdot 10^{20}$ in water, calculated per cubic millimeter.

2. The second kind of bioplasma, metabolic, is achieved through biochemical reactions of the organism with indirect enzymatic phases of catalysis, and the creation of radicals and ions. The energy supply for plasma-forming processes could be related with oxidation processes in mitochondria, the ~~de~~synthesis of proteins in ribosomes and photosynthesis in chloroplasts. The generation of plasma components by chemical means leads to the introduction of electrons in oxidation ~~oxygen~~ reduction processes, the transfer of electrons during phosphorylation, their liberation in catabolism, and the production of free positive and negative radicals, as well as of ions, hydrated electrons [16], and hydrated protons, and finally the initiation ~~introduction~~ of protons [19, 17]. In plasma-forming processes they play a role analogous to that of positive holes in an inorganic semiconductor. Indiviudal situations have been proven experimentally, and these form a large reservoir of facts which have not been totally treated in the interpretation of life mechanisms.

Thus metabolic bioplasma exists everywhere in the organism where ~~that~~ a transfer of matter occurs, and thus excludes only horny parts, tooth enamel and atrophied bark cells on trees. Metabolic plasma is a universal energetic state of an organism, somehow passing through the structural plasma under

conditions of reciprocal interaction. A particular region of metabolic plasma is the subcellular structure of intensified transfer of matter, such as mitochondria, ribosomes, chloroplasts and nerve cells in the brain consuming the greatest amount of oxygen, and thus distinguished by the greatest amount of catabolism.

Since plasma is treated in physics as a neutral electrical fluid, with the laws of hydrodynamics and electrodynamics applied to it, we can speak of it without exaggeration as a "through-flow" of metabolic plasma in the midst of structural plasma. Both electrical fluids behave according to their own individuality, but interact reciprocally on each other. Thus there are two plasma systems in an organism, one described up to now in molecular biology and quantum biochemistry (structural bioplasma) and the other expressed in chemical reactions (metabolic plasma).

Information and Bioplasma

The two plasma subsystems require an efficient information apparatus for the purpose of coordinating the work of the entire organism. It must be added that any high-energy system in an unstable equilibrium requires low intensity signals for control.

The double description of plasma, macroscopic and microscopic, are characterized as it were by two levels of information and by their natures. These may only be electromagnetic waves in the visual spectrum or in free rhythms when plasma is treated as whole. An indispensable property of plasma is radiation in the visual spectrum (light plasma), and others are electrical and magnetohydrodynamic waves, both at low frequencies [28]. Thus bioplasma is a recipient of all information from the environment and ultimately transforms it into photons.

The quantum emission of photons through a living system is a matter which has been sufficiently proven already, both in reference to cells and mitochondria with a characteristic maximum in the long-wave ultraviolet range of 330-350 mm [4], in dividing cells [33], ~~and~~ in the weak luminescence of organisms [18], and ~~of~~ in working muscles and nerves [38]. Low frequency electromagnetic radiation is noted in the work of the brain, the heart muscles, and actually all organs. The only open problem remaining is the question of whether this general radiation of organisms is to be attributed to bioplasma or not. However, the correlations between the two scales of plasma description and radiational effects are extremely obvious.

Reconstructing the bioplasma situation would require receiving reciprocal communication from structural and metabolic plasma about their parameters, and therefore their density, temperature, ionization state, recombination processes in progress, chemism, magnetic and electrical situations, pressure, oxidation, anabolic-catabolic equilibrium, etc. The informational system is based on photons generated on principles of electroluminescence in molecular or subcellular structures of the sandwich type or, on the other hand, with photons of chemiluminescent origin [31].

It seems that the electromagnetic information from the two bioplasma subsystems mentioned does not exhaust the possibilities. Up to now the set of piezo-electric features of organic compounds and of tissues has not been taken into consideration. In a variable electrical field piezo-electrics is a quantum generator of acoustic waves. Photon and phonon quantum processes occur together in the environment of a piezo-electric semiconductor. Thus phonons form a new informational factor in the biosystem. Again they correlate with plasma B because, like all plasmas, it is piezo-electric. An acoustic wave propagating in a piezo-electric medium excites electrical oscillations as a result of changes in polarization.

In the final analysis all of the information in the piezo-electric medium of a semiconductor and plasma turns out to be electromagnetic phenomena. This extremely uniform informational system of the bioorganism is conditioned by the nature of the organic semiconductor of its basic mass [32], Figure 1.

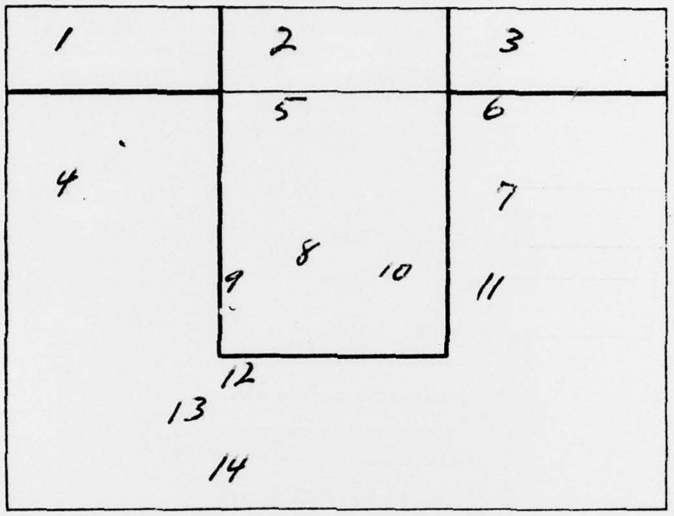

Figure 1. Diagram presenting bioplasma as an information base in a living organism. An exchange of electromagnetic information and quantum acoustic information takes place between the metabolic and structural bioplasma. Bioplasma oscillations as a whole are expressed by electrical and magneto-hydrodynamic pulsation. Key: 1-biochemical reactions, 2-informational system, 3-electronic functions, 4-metabolic plasma, 5-phonons, 6-piezo-electric, 7-structural plasma, 8-photons, 9-chemiluminescent processes, 10-biolaser processes, 11-protein semiconductor, 12-electrical waves, 13-magnetohydrodynamic waves, 14-bioplasma.

Bioplasma appears to be the only relay of the completely encoded information received and transmitted in the course of phylogenesis and ontogenesis, because only it is invariable in its essence and never permits any deviations of the genetic mutation type. Plasma seems to occasion two

contradictory evolutionary processes, differentiation and integration. Despite far-reaching possibilities of differentiation in density, chemical composition, energetics and individual quantum reactions among elementary components, it always remains the plasma state. On the other hand it operates in an integrated manner through electromagnetic pulsation modulated by wavelength, amplitude, mode, or polarization.

The Specifics of Bioplasma

It is absolutely necessary to add that bioplasma does not at all mean cytoplasm, and these two concepts must not be confused. Bioplasma is an analog of physical plasma, and therefore of the fourth state of concentration of matter, with the greatest resemblance to solid state plasma, and therefore does not require a vacuum as an environment (gas plasma), but molecular fields of organic molecules.

Bioplasma is not composed only of mobile electrical elements of organic structures and protons from hydrogen bridges and quasi-crystalline aqueous networks, but is also composed of metabolic transfer products, thus radicals, ions and electrons from oxidation reduction processes.

Particular attention should be devoted to hydrated electrons, which escape as very elementary negative ions and often appear in the environment of organic reactions, particularly in the water component [11], and to hydrated protons, which can effectively escape again as extremely simple positive ions, which cannot help being of great importance for plasma-forming properties in connection with the special role of water in the living organism [39] and its proton semiconductor nature. Bioplasma is continuously supplied with new component elements as a result of chemical reactions. This constitutes its unique peculiarity in nature.

In laboratory situations proteins are not independent semiconductors. The movement of the charges requires an energy supply, although in the biological situation they may have considerably more conductivity as a result of water content.

The self-sufficiency of bioplasma is a combination of chemical processes with electronic processes in the area of the organic compounds forming the semiconductor mass of the system. In this interpretation, as a result of the death of an organism, there no longer is any bioplasma, although the molecular structures of semiconducting proteins and nucleic acids exist, and chemical reactions do not die in the first phase, although the combination of chemical processes with the electronic functions of the system is frustrated.

The origin of bioplasma in two sources, as it were, electron molecular structures and chemical processes, constitutes its most essential trait, distinguishing it from solid state plasma, as well as from plasma-forming transitional states in chemical reactions in vitro.

A second specific feature is the combination of stabilization and degradation processes of the plasma as a general feature of this state of matter with catabolims and anabolism. The rhythm of anabolic-catabolic fluctuations is not only a result of the unstable equilibrium of the plasma state, but is also associated with the reconvertibility of the standardized chemical processes and of the measured electronic processes of the system. In addition the supply of energy in the plasma stabilization processes is not obtained exclusively from energetic reserves in the environment, but necessarily requires energy released catabolically, and therefore autogenic energy. External energy must, as it were, pass through a stage of chemical bonding and secondary release with indirect processes of the movement of electrons and free radicals, and this is a multistage enzymatic catabolic process.

Considering the lack of counterparts in nature, we may speak of bioplasma as the fifth state of matter. Biological plasma is responsible for the dynamics of a living system, because it unites in itself combined electronic and metabolic processes and the quantum emission of photons and phonons. The energetics of the system is unusually simple in its assumptions, complicated in its concrete functioning, and is a property only of an animate system. B plasma is not exclusively a solid state plasma, is not suited to biochemical reactions alone, and does not represent the only electronic process in a semiconducting protein medium. Here the bioelectronic and biochemical descriptions are complementary, in complementing bioelectronics through chemically associated energy and in complementing metabolism by quantum photon and phonon processes, as well as through additional sources of energy in the biosystem not previously considered.

Bioplasma transcends the metastable state, which Szent-Gyorgyi postulated for the biological system, although in a somewhat different concept. Plasma B is a "global metastable state", and represents the moderated play of energetics of the living organism on the level of general excitation. The descent of bioenergetics to the basic level is equivalent to death for the organism and, looked at from the viewpoint of bioplasma, is a successive extinction of metastable states up to the point of no return for renewed excitation. In plasma physics this is called degradation of the plasma state.

At the same time the metastable bioplasma level determines the low energy of activation, since everything is conducted in a highly energetic medium. But on the other hand, the evolution of electronic and chemical processes on the level of total excitation requires only slight energy for controlling everything, and at the same time makes the structure exceedingly sensitive to even minimal energetic deviations in the medium. This explains

the reaction of the entire metabolism to small intensities in electromagnetic fields when thermal fronts change in the atmosphere.

The metastability of electronic processes is understandable from the quantum standpoint, but it is more difficult to understand the "metastability" of chemical reactions. This does not refer to a single reaction, but to the anabolic-catabolic equilibrium, over which the entire enzymatic system "watches", no less metastable in the antagonistic activity of activators and inhibitors. The general situation of metabolism as a whole is metastable, and therefore the least deviation from the necessary tolerance for the functioning of the entire unit is ~~perceived~~ perceptible. Plasma B is a total biomass state which can be defined as a macroerg state.

Theoretically it is possible to speak of a stable electron-chemical state of an organism, and this is undoubtedly how it should be presented. It represents the specifics of bioplasma. The plasma state of a living organism unites in itself specified elements, coordinates them and even makes their existence possible.

Bioplasma is ceasing to be a concept, and reproducing the complex energetics of an organism is becoming reality. Analogs of this system do not exist in nature, and every treatment of Plasma B as only a new solid body plasma modification is a misunderstanding of its biological nature.

The dynamics of life is an ability to control mobile semiconducting electrons in the protein structures, and an ability to involve photons in the complex activity of electronic processes with chemical ones and, in this way, to maintain the reversibility of chemical reactions in the rhythm and range necessary for the performance of the entire system. In short in a living organism the dynamics represents an ability to use structural electrons and chemical transformations to maintain a biological state defined by the term

life, with the use of energy from autogenic photons and phonons. The dynamics of life is bioelectronic and biochemical processes maintained at a high energy level. All of this provides one concept of bioplasma.

It must be thought that the turning point ~~of no return~~ in the newest biology will be the proposal of a basic equation which, in formalized shape, would require: M + Be = Bp (M-metabolism, Be-bioelectronics, Bp-bioplasma). In essence this is no more than an expansion of the concept of metabolism with necessary emphasis ~~of~~ on the electronic features of the living system.

Bibliography

[1] Athenstaedt H. — *Die ferroelektrischen und piezoelektrischen Eigenschaften der Organismen.* Naturwissenschaften 47, 455, 1960.

[2] Athenstaedt H. — *Permanent Longitudinal Electric Polarization and Pyroelectric Behaviour of Collagenous Structures and Nervous Tissue in Man and other Vertebrate.* Nature 228, 830, 1970.

[3] Bachman Ch. H., Friedman H., Becker R. O. — *Psychiatric Ward Behaviour and Geophysical Parameters.* Nature 205, 1050, 1965.

[4] Barenboim G. M., Domański A. N., Turoverov K. K. — *Luminescence of Biopolimers and Cells.* New York — London 1969.

[5] Beament J. W. — *Electrical Properties of Orientated Lipid on a Biological Membrane.* Nature 191, 217, 1961.

[6] Blaurock A. E. — *X-ray Diffraction Pattern from a Bilayer with Protein Outside.* Biophysical Journal 13, 281, 1973.

[7] Boulton A. A. — *Biochemical Research in Schizophrenia.* Nature 231, 22, 1971.

[8] Bullock F. J. — *Donor-Acceptor Complexes in Solution.* In: Comprehensive Biochemistry vol. 22. Bioenergetics. Amsterdam — London — New York 1967.

[9] Duchesne J., Depireux J., Bertinchamps A., Cornet N., van der Kaa J. M. — *Thermal and Electrical Properties of Nucleic Acids and Proteins.* Nature 188, 405, 1960.

[10] Eley D. D., Spivey D. I. — *Semiconductivity of Organic Substances.* Part 9. Nucleic Acid in dry State. Trans. Faraday Soc. 58, 411, 1962.

[11] Elliot W. R. — *Stabilization of Hydrated Electrons in Irradiated Frozen Sugar Solutions.* Science 157, 558, 1967.

[12] Fiałkowski K. R. — *The Evolutionary Processes of Randomly Growing Mutated Digital Structures as a Model of Evolution of the First Living Organisms.* Second International Joint Conference of Artifical Intelligence. London 148, 1971.

[13] Furukawa T., Fukada E. — *Piezoelectric Effect and its Temperature Variation in Optically Active Polypropylene Oxide.* Nature 221, 1235, 1969.

[14] Gouterman M. — *Excited States of Porphyrins and Related Ring Systems.* In: Excited states of matter. (Shoppes C. W. Ed.) Grad. Studies Texas. University. 2, 1, 1973.

[15] Harris J., Tsutsui M., van Duuren B. L. — *Pi Complexes in Biological Systems.* Science 158, 1707, 1967.

[16] Hart E. J. — *The Hydrated Electron. Science 146, 19, 1964.*

[17] Luck W. A. — *Zur Spezifität der Wasserstoff—Brückenbindung.* Naturwissenschaften 54, 601, 1967.

[18] Mamedov T. G., Popov A. — *The Ultra-weaek Luminositi of Living Organisms.* In: Fifth International Congress on Photobiology, Hanover USA. Hd—5, 1968.

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BIBLIOGRAPHY

[19] Mitchell P. — *Proton Current Flow in Mitochondrial System*. Nature 214, 1327, 1967.

[20] Pines D., Schrieffer J. R. — *Collective Behaviour in Solid—State Plasmas*. Physical Review 124, 1387, 1961.

[21] Pullman A., Pullman B. — *Quantum Biochemistry*. In: Comprehensive Biochemistry vol. 22. Bioenergetics. Amsterdam — London — New York 1967.

[22] Queisser H. J. — *Versetzungen in Silicium*. In: Festkörperprobleme Berlin Bd. 2, 162, 1963.

[23] Rosenberg B. — *Electrical Conductivity of Protein*. Nature 193, 346, 1962.

[24] Sedlak W. — *Elektrostaza i ewolucja organiczna*. Roczniki Filozoficzne 15 (3), 31. 1967.

[25] Sedlak W. — *Model układu emitującego pole biologiczne i elektrostaza*. Kosmos A, 16, 151, 1967.

[26] Sedlak W. — *ABC elektromagnetycznej teorii życia*. Kosmos A, 18, 165, 1969

[27] Sedlak W. — *Plazma fizyczna i laserowe efekty w układach biologicznych*. Kosmos A, 19, 143, 1970.

[28] Sedlak W. — *Magnetohydrodynamika biologiczna w zarysie*. Kosmos A, 20, 191, 1971.

[29] Sedlak W. — *Laserowe procesy biologiczne*. Kosmos A, 21, 533, 1972.

[30] Sedlak W. — *Ewolucja bioplazmy*. (w druku)

[31] Sedlak W. — *Elektromagnetyczna przemiana energii w żywym ustrçju* (w druku).

[32] Sedlak W. — *Podstawy bioakustyki kwantowej* (w druku).

[33] Stauff J., Reske G. — *Lumineszenz von Hefe*. Naturwissenschaften 51, 39, 1964.

[34] Szent-Györgyi A. — *The Study of Energy-Levels in Biochemistry*. Nature 148, 157, 1941.

[35] Szent-Györgyi A. — *Introduction to a Submolecular Biology*. New York — London 1960.

[36] Szent-Györgyi A. — *Bioelectronics*. New York — London 1968.

[37] Szent-Györgyi A. — *Bioelectronics*. Science 161, 988, 1968.

[38] Sztrankfeld I. G., Frank G. M. — *O luminescencji gigantskich nierwnych wołokon pri wozbuždienii*. Biofizika 9, 321, 1964.

[39] Tanny G. — *Hyperfiltration Streaming Potential as a Probe of Water Structure in Membranes*. Nature 242, 474, 1963.

[40] Vasilescu D., Cornillon R. Mallet G. — *Piezoelectric Resonances in Amino Acids*. Nature 225, 635, 1970.

[41] Wang J. H. — *Facilitated Proton Transfer in Enzyme Catalysis*. Science 161, 328, 1968.

[42] Waver R. — *Einfluss schwacher elektro-magnetischer Felder auf die circadiane Periodik des Menschen*. Naturwissenschaften 55, 29, 1968.

[43] Zimmermann H. — *Stany protonowe w chemii*. Angewandte Chemie 76, 1, 1964 (tł. pol.) W: Postępy Chemii I. Warszawa 1966.

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